

**WHAT IS CLAIMED IS:**

1. Buck type voltage regulator with at least two phases comprising:

first switching means that selectively connect a supply voltage to a load through a first current path;

5 second switching means that selectively connect said supply voltage to said load through a second current path;

a first activation circuit that activates said first switching means;

a first delay circuit that deactivates said first switching means after a first period of time;

10 a second activation circuit that activates said second switching means; and

a second delay circuit that after a second period of time deactivates said second switching means,

said first period of time depends on said supply voltage and on the output voltage;

said second period of time depends on said supply voltage and on a voltage

15 proportional to the difference of current that flows in said first and second current path.

2. Voltage regulator in accordance with claim 1 wherein said first activation circuit and said second activation circuit activate said first switching means and said second switching means in response to a decrease of the output voltage; said  
20 second switching means being activated after the activation of said first switching means.

3. Voltage regulator in accordance with claim 1 wherein said current that flows in said first and second current path is filtered by a low-pass filter and integrated by a differential integrator in current.

25 4. Voltage regulator in accordance with claim 2 wherein said first activation circuit receives a signal from a comparator that compares said output voltage with a preset reference voltage.

5. Voltage regulator in accordance with claim 1 wherein first delay circuit comprises a current generator that loads a capacitor until the voltage at the ends of said capacitor reaches said output voltage.

6. Voltage regulator in accordance with claim 5 wherein said current generator  
5 supplies a current proportional to said supply voltage.

7. Voltage regulator in accordance with claim 1 wherein said second delay circuit comprises a current generator that loads a capacitor until the voltage at the ends of said capacitor reaches said voltage proportional to the difference of current that flows in said first and second current path.

10 8. Voltage regulator in accordance with claim 1 wherein said first activation circuit activates said first switching means in response to a decrease of the output voltage; said second switching means are activated after the activation of said first switching means.

9. Voltage regulator in accordance with claim 7 wherein said second switching  
15 means are activated after preset time equal to  $T_{sw}/2$ .

10. Voltage regulator in accordance with claim 2 wherein it comprises a bistable circuit which after the activation of one of said first and second activation circuits enables the other of said first and second activation circuits.

11. Voltage regulator in accordance with claim 1 wherein said first period of time  
20 is directly proportional to said supply voltage and inversely proportional to said output voltage.

12. Voltage regulator in accordance with claim 1 wherein said second period of time is directly proportional to said supply and inversely proportional to inversely proportional to said voltage proportional to the difference of current that flows in said  
25 first and second current path.

13. Voltage regulator in accordance with claim 2 wherein said first activation circuit receives a signal from a comparator that compares a signal equal to said output voltage minus the RMS voltage of one stage with a preset reference voltage.

14. An electronic system, comprising:  
30 a load;

a first switching circuit that selectively connects a supply voltage to the load through a first current path;

a second switching circuit that selectively connects the supply voltage to the load through a second current path;

5 a first activation circuit that activates the first switching circuit;

a first delay circuit that deactivates the first switching circuit after a first period of time;

a second activation circuit that activates the second switching circuit;

10 a second delay circuit that after a second period of time deactivates the second switching circuit;

wherein the first period of time depends on the supply voltage and a voltage across the load; and

15 said second period of time depends on said supply voltage and on a voltage proportional to a difference between the currents that respectively flow through the first and second current paths.

15. A method, comprising:

driving a current through a load via a first path for a first period of time that depends on first and second voltages; and

20 driving the current through the load via a second path for a second period of time that depends on the first voltage and on currents that respectively flow through the first and second paths.

16. The method of claim 15 wherein:

driving the current through the load via the first path comprises coupling the first voltage to the load via the first path for the first period of time; and

25 driving the current through the load via the second path comprises coupling the first voltage to the load via the second path for the second period of time.

17. The method of claim 15 wherein the first voltage comprises a supply voltage.

18. The method of claim 15 wherein the second voltage comprises a voltage across the load.

19. The method of claim 15, further comprising:

determining a difference between the currents that respectively flow through the first and second paths; and

determining the second period of time based on the difference between the  
5 currents.

20. The method of claim 15 wherein:

driving the current through the load via the first path comprises,

coupling the first voltage to the first path, and

uncoupling the first voltage from the first path after the first period of time has  
10 elapsed; and

driving the current through the load via the second path comprises,

coupling the first voltage to the load via the second path, and

uncoupling the first voltage from the second path after the second period of  
time has elapsed.